A few years ago, I found myself in a challenging relationship with someone who struggled deeply with emotional turmoil. Despite her frequent bouts of distress, I approached each situation with patience, kindness, and a genuine desire to understand her pain. Over time, she confided in me about her past experiences with emotional manipulation and abuse, which had severely impacted her self-worth. This revelation was a pivotal moment for me. I became acutely aware of the profound impact that words and communication can have on an individual's psyche. This realization ignited my interest in **Natural Language Processing (NLP)** as a means to harness technology for emotional healing and support.

1 Research Experience

Abuse Prevention and Emotional Support via NLP. Determined to make a difference, I reached out to Professor Nancy Fulda at Brigham Young University (BYU) Deep Representations and Architectures for Generative systems and Natural language understanding (DRAGN) Lab. Under her guidance, I embarked on a project to develop a software application utilizing BYU's large language model, EVE. We focused on pretraining the model with curated content emphasizing self-worth, prevention strategies against physical and verbal abuse, and therapeutic counseling information. The goal was to create a tool that could provide users with resources for healing and empowerment. Our project's impact was recognized when we **won first place at the 2022 BYU ACM YHack Hackathon**.

Smart Farming Robotics with Computer Vision. My passion for leveraging technology to address real-world problems extends beyond NLP. Witnessing my grandmother and other elderly farmers struggle with the physical demands of agriculture due to age and climate challenges, I was inspired to explore robotics and smart farming solutions. I developed a farming robot inspired by 3D printing principles, capable of automatically distributing water, fertilizer, and weed killer with precise movements. The robot utilizes components such as Raspberry Pi, Arduino, Lidar sensors, linear actuator, and stepper motors to efficiently navigate and operate on farmlands. This innovation aimed to alleviate the burdens on aging farmers and enhance agricultural productivity in the face of global warming. Our efforts resulted in **winning the 2023 BYU ITCSA Raspberry Pi Competition**.

Cybersecurity Attack Classification via NLP. At Sandia National Laboratories, I tackled cybersecurity challenges by integrating the DistilBERT model with Transformer architectures to classify security log data into 24 categories of cyberattacks. Rapid detection and classification are crucial for organizations to mitigate threats and prevent financial losses. Our model achieved an impressive 99.7% accuracy and was honored with **first place in the Machine Learning category at the 2024 BYU Capstone Celebration Competition.**

Automating IT Ticket Resolution via NLP. During my tenure at Pattern Inc., a unicorn company specializing in e-commerce solutions, I noticed that support engineers were overwhelmed with repetitive IT tickets. To streamline this process, I pre-trained GPT-3.5 and LLaMA2 models but found they lacked precision in generating accurate responses. Through research, I implemented a Retrieval-Augmented Generation (RAG) approach combined with word embedding techniques. By vectorizing a bespoke dataset of questions and answers, we automated the IT ticket resolution system, reducing resolution times by 87% and workload by 78%. This significant improvement earned me the **"Employee of the Year"** award among 1780 employees at the Accelerate 24 event, one of the best E-Commerce Conferences in the United States.

2 Research Interests

These diverse experiences have equipped me with a unique perspective and a deep understanding of the

challenges faced by individuals from various backgrounds. I am eager to leverage these insights to develop innovative solutions on **Human-Robot Interaction** integrating **Natural Language Processing** and **Robotics**.

Addiction Recovery Counseling Robot. Approximately 50% of Americans aged 12 and older have used illicit drugs at least once, and 14% struggle with pornography addiction. To enhance the robot's ability to provide empathetic support, I propose integrating computer vision techniques to analyze users' facial expressions and body language alongside their verbal communication with NLP. By employing advanced neural networks for emotion recognition, the robot can detect subtle cues of discomfort, anxiety, or distress that may not be evident through words alone. This multimodal analysis enables the creation of a more responsive and understanding companion, capable of adapting its interactions to the user's emotional needs in real-time. This innovation not only makes the counseling more effective but also provides a unique approach to supporting individuals battling addiction, aligning with my goal of leveraging technology to make mental health care more accessible and personalized

Depression Therapeutic Robot. As 280 million people in the world suffer from depression, I aim to develop a therapeutic robot that provides warm, gentle physical comfort through motions like hugging and patting, simulating human touch to improve emotional well-being for individuals with depression. By integrating thermal elements, LiDAR sensor, tactile sensors, and haptic feedback, the robot can mimic human gestures, while reinforcement learning enables it to adapt its interactions based on the user's verbal and non-verbal responses. Utilizing real-time emotional analysis with computer vision and NLP, the robot adjusts its warmth and touch according to the user's emotional state. This personalized, evolving support system complements traditional therapy, making mental health support more accessible and improving the quality of life for those struggling with depression.

3 Conclusion

Stanford University's Master of Science in Computer Science program is the ideal environment for me to pursue these ambitions. I am particularly drawn to **Professor Diyi Yang**'s work as the Director of the **Social and Language Technologies Lab**. Her research on developing NLP solutions to address societal challenges resonates deeply with my goal of creating empathetic AI counseling tools. Additionally, I am eager to work with **Professor Dorsa Sadigh** on her research at the intersection of robotics and machine learning in **Stanford Intelligent and Interactive Autonomous Systems Group**, focusing on interactive robot learning and building robots that learn from and adapt to humans, complements my goal of creating adaptive and human-aligned robotic systems. Furthermore, **Professor Jeannette Bohg**, who directs the **Interactive Perception and Robot Learning Lab**, explores on robust sensorimotor coordination in humans and its implementation on robots, particularly in robotic grasping and manipulation, grabbed my attention as it aligns with my interest in developing therapeutic robotic companions that interact seamlessly with users.

Looking beyond the master's program, I aspire to lead initiatives that bridge government, academia, and industry to combat pervasive issues such as addiction, trauma from abuse, and mental health challenges. By harnessing technology, knowledge, and compassionate leadership, I aim to establish an organization dedicated to providing accessible support systems worldwide. Stanford's resources, network, and culture of innovation will be instrumental in achieving this vision.